NCPA Downlink

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Serving Amateur Radio Digital Communication in Northern California

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What's Wrong With My Packet?

Eric Williams, WD6CMU

Just about everybody starts off in packet radio by slapping a TNC and a 2-meter radio together and contacting the local BBS. For a lot of people, however, this turns out to be a disappointing and frustrating experience. They often must suffer failed connections or that drop out in the middle of a session, or the data might flow like molasses. Some of these might be an inescapable result of the path between the two stations involved, but often times it is a matter of a packet station that just hasn't been properly tuned yet to avoid the limitations of packet radio.

The Antenna

Most hams know that packet radio can share a channel between several stations by taking turns transmitting. This technique is called *time domain multiplexing*. What hams seldom appreciated, though, is that in order for this to work, every station on a channel must be able to hear every other station so that each can avoid transmitting at the same time as any other. Although this is an ideal situation that rarely occurs on a real-world packet channel, efficiency improves as we get closer to this ideal. And to do this, we need a good antenna.

Lots of hams figure that, since they are very close to the BBS that they're talking to, they can get away with using a rubber duck on an HT, or some other cobbled-together indoor antenna. This short-cut misses the fact that not only does the BBS have to hear you, but so does everyone else on the channel, whether you want to talk to them or not. Otherwise, these other stations will not be able to tell when you are transmitting and will likely transmit at the same time as you, causing one or the other of you to loose the packet and retry.

In order to allow your TNC, and everybody else's, to operate as designed, you've got to have your antenna up in the air and in the clear so that you can hear and be heard on the channel. What you put up there is a secondary consideration — quarter-wave ground plane antennas work just fine — but if it isn't above the roofline of your QTH, even if you are next-door to the BBS, you are asking for trouble.

Fringe stations with beam antennas or high-powered transmitters can also cause problems. Such a station might be able to be heard by the BBS, but many other stations sharing the frequency that are off to the side of the beam's pattern or beyond the station's range will be unable to hear its transmissions and avoid collisions. Remember that the ideal situation is one in which everyone on a frequency can hear everyone else. Anything you do to approach this ideal will help the situation; anything which deviates from it will degrade performance — if not for you, then for someone else on the channel.

Audio level and deviation

The modem inside your TNC -- the part that turns the sound into digital bits and visa-versa — was designed to be low in cost, rather than high in performance. As a consequence, it requires a fairly high quality audio input in order for it to do its job. Just about all voice-quality FM radios can produce adequate audio — if the packet station is properly tuned. The biggest source of problems in this area is the correct deviation setting of the transmitter. Excessive deviation will result in audio distortion that will prevent the receiving modem from decoding the bits correctly, resulting in lost packets and lots of frustration.

The deviation of your signal should ideally be in the 3.5-4KHz range, but it is better to be below that number than above it. If you don't have a deviation meter to set the correct level, a second radio can be used to set the deviation by ear. Most established BBSs and nodes have had their deviation adjusted correctly, so by simply listening to your signal as you digipeat your packets through one of these and adjusting your transmit audio level until the two sound the same, you will end up with very close

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In This Issue

Please Help!

Gary Mitchell, WB6YRU
Acting Downlink Editor

Yes, the Downlink has been few and far between recently. The reason?

WE NEED AN EDITOR!

Our president has stepped forward to pick up the slack, but this is NOT a permanent solution.

The Downlink is supposed to come out once per quarter. Memberships are being extended to compensate.

That's the bad news. The good news is that unlike some clubs and associations, the NCPA editor only has to do part of the job. We already have someone who does the publishing and layout (Eric WD6CMU) and another who does the printing and mailing (Bob N0ARY).

The NCPA editor calls the shots regarding the newsletter. He/she beats the bushes for articles, perhaps writes one or two him/herself, checks spelling and grammar, coordinates articles with previously published articles (e.g. multiple parts), and sends them to Eric. That's not so bad, is it?

So, if you are reasonably competent with written English, have a computer with some kind of word processor, and are familiar with amateur radio (familiarity with packet is a plus, but not necessary)—then the NCPA needs YOU!

Please contact the president: Gary WB6YRU @ N0ARY or the VP/publisher: Eric WD6CMU @ WD6CMU.

Thanks!

News Flash!

The NCXPN has become the PSNC, the "Packet Sysop's of Northern California."

As many of you may know, the NCPA includes several special interest groups in packet. One of these is the NCXPN, "Northern California AX.25 Packet Network." That's a fancy name for the packet BBS sysop's in the region.

At a recent meeting, the sysop's decided to change the name to something more in tune with who and what they are.

By the way, one doesn't "join" the PSNC. If you are a BBS or forwarding gateway sysop in Northern California, then you are automatically a member of the PSNC.

The NCPA *Downlink*

Acting Editor:
Gary Mitchell, WB6YRU
BBS: WB6YRU@N0ARY.#NOCAL.CA.USA.NOAM
Internet: wb6yru@arasmith.com

Layout/Typesetting:
Eric Williams, WD6CMU
BBS:
WD6CMU@WD6CMU.#NOCAL.CA.USA.NOAM
Internet: wd6cmu@netcom.com

Printing:
Bob Arasmith, N0ARY
BBS: N0ARY@N0ARY.#NOCAL.CA.USA.NOAM
Internet: bob@arasmith.com

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High-Speed Digital Communications for Radio Amateurs

Bruce Perens AB6YM

Introduction

For those of you who don't know me, I'm a local TCP/IP packet operator and developer in my spare time of "Linux for Hams". I work at Pixar, where I've written special-effects software that's been used for a whole bunch of movies. I've also written a software debugging program called "Electric Fence" that some of you may have used.

Today, most packet radio operators still operate only 1200 baud equipment. I'll survey the higher-speed equipment and detail how you can get on the air.

Modulation

1200 baud packet uses audio-frequency-shift keying (AFSK). That means it transmits a changing audio tone, usually making use of an unmodified voice radio.

Although you can get a 2400 baud signal through a voice radio, much higher speeds won't make it because of insufficient bandwidth through voice radios.

Wait a Minute! They Get 28,800 Baud Through A Phone! Why Can't My Voice Radio Go That Fast?

It can, given special circumstances.

You might be able to communicate that fast using modems over a *full-duplex, point-to-point* radio circuit. This would mean you'd need two sets of transmitters and receivers so that you could send audio in both directions at once the way your phone does. 28.8K modems are able to communicate so quickly because they use many separate audio carriers at once, and they use simultaneous changes in amplitude *and* phase to pack the most information into each carrier. The downside of this method of communication is that before you start using it, you must carefully adjust the modem to the response characteristics of the audio circuit, a process called *equalization*. Your modem spends several seconds equalizing the circuit every time you place a call, during which time the modems on each side of the connection send each other test tones and report the results. What would happen if you used the same modulation as your modem on packet, without the full-duplex circuit? Every high speed packet would have to start with an equalization sequence so that the receiver would be able to understand it. You'd have a one or two-second prelude to every packet, and that would eat up the speed advantage.

Well, If You Can't Modulate the Way My Modem Does, What Do You Do?

We use two forms of modulation predominantly. One is Frequency-Shift Keying (FSK). This is like the Audio-Frequency-Shift Keying used for 1200 baud, but we vary the frequency of the transmitter, rather than the frequency of an audio tone. 9600 baud packet, which uses FSK, lets us send more information in the same amount of time, but because it uses FSK, we can't use an unmodified voice radio to transmit it. Fortunately, the modification necessary to use FSK is quite simple, so today a lot of voice radios claim to be *9600-ready* at the flip of a switch, with varying degrees of truthfulness.

Another form of modulation that's becoming popular is *spread-spectrum*. This simply means that you don't stay on one channel for very long. The typical spread-spectrum signal stays on one channel for long enough to send a few bits and then changes channel. If you're listening to a voice radio and there's a spread-spectrum signal visiting the frequency you are listening to, you might hear it as an intermittent tapping sound, if you hear it at all. Because spread-spectrum radios are always computer-controlled — they can do "smart" things about their frequency use. For example, if there's an interfering signal on one of the channels they are using, they can stop using that channel and substitute another. Spread-spectrum radios are generally good at staying out of each other's way as well. Many of them can be using the same set of channels simultaneously without interfering with each other.

Perhaps the most important thing about spread-spectrum for packet radio is that it can avoid *multipath*. Multipath is a radio "echo", best known for making "ghost" images on your TV. It's caused by a signal arriving at your antenna after following several different paths of different distances, because the signal bounced off of obstacles, etc. The various different path lengths cause the signal to arrive at your station at different times, a few microseconds apart. When using your voice radio, multipath isn't much of a problem because you can still understand the signal even when there are echoes separated from the main signal in time by a few microseconds. But what if you're sending high-speed packet and the time used to transmit each bit is measured in the microseconds? Multipath can then be a tremendous problem - if you look at it on a 'scope, your bits appear to be *smeared* because of it. Spread-spectrum can avoid much of the problem of multipath because the channel changes so fast. By the time an echo arrives, the spread-spectrum system is already listening on a different frequency and thus doesn't hear it. There are other advantages to spread-spectrum as well, but they're beyond the level of this discussion (which is another way of saying "I don't feel competent to explain them"!).

Available Equipment

Radios

The majority of the commercially available high speed packet equipment today are 9600 baud systems. The October 1995 QST has a review of **so-called** 9600-ready radios. If you look at the fine print, you'll find that many of these radios take more than one tenth of a second to switch from transmit to receive or vice versa. At 9600 bits-per-second, a tenth of a second is enough time to transmit 120 bytes. There are only 41 bytes in this sentence. So, you can see why we want the radios to switch from transmit to receive and vice versa as quickly as possible. The time to switch is called the *turn-around time*, and you'll see measurements for two of them: transmit-to-receive and receive-to-transmit. The faster or better turn-around times are the ones with the *smaller* numbers. In some cases QST was quoting the transmit-to-receive time with the squelch on, which is irrelevant for 9600 since we operate the radios open-squelch all of the time. I haven't spoken with Ed Hare at the ARRL Lab about this yet.

The very last radio reviewed in the QST article was a Yaesu. The turn-around times for this radio was 4 to 6 times faster than the others reviewed. I

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High-Speed Digital Communications for Radio Amateurs

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haven't checked out this radio myself, so I can't say if it's a good buy or not.

The other alternative is fixed-frequency radios. You can get the typical "rock-bound" (crystal controlled) radio to turn around much faster than a synthesized radio because the synthesized radio has to wait for the PLL to lock on frequency.

I have information on my WWW site on converting the Motorola, Micor, and Mitrek two-way radios to 9600 packet. You may have to replace the crystal filter in these radios to get sufficient bandwidth for 9600 - but some people claim if you don't, you only get one bad packet in 100 and this is tolerable.

TEKK makes a pocket-size 9600-ready radio with two watts output called the KS-900. They also make one called the KS-960 that is better for voice but worse for packet. I have a KS-900 and a KS-960. I found that with this little power, the only way to get any signal out of the radio was to mount it at the antenna. Fortunately, they seem to work fine with 60 feet of shielded twisted-pair wire between the radio and the TNC. The TEKKs were very desirable when they cost $70. They are now up to $150 with the crystals, which is a lot for a 2-watt radio. Remember, if you put an amplifier on these radios, you don't want the amplifier to slow down the turn-around time. Thus, you generally want to use an external keying input to the amplifier, rather than the carrier-operated relay that most FM voice amplifiers use.

Kantronics sells a DataRadio, which is actually capable of 19,200 baud operation with most 9600 TNC's, as well as compatible 9600 operation. It does this by substituting its own modulator and "data slicer" circuit for the one in the TNC and communicating digital rather than analog information with the TNC. The Kantronics DataRadios are so expensive that most people choose a synthesized radio instead.

TNC's

There are TNC's from Kantronics, AEA, and others. I own two of the Kantronics ones and they seem to be the best value for the money. They are the only ones that can operate 1200 and 9600 **simultaneously** instead of one-at-a-time. They have a good BBS and an OK NetROM emulation, and there are optional ROMs for TheNET that improve the NetROM emulation. They can be programmed remotely via radio, which means you can stick one on a hilltop as a relay station and reprogram it without having to drive up the hill. They seem to perform OK on the air.

If you want to use TCP/IP, consider an internal card rather than an external TNC with a serial connection. This is because when using TCP/IP, your computer makes the "acknowledge" packet. When using other protocols, that ACK packet comes from the TNC itself. Since most external TNC's communicate with the computer at no more than 19,200 baud, there's a delay added for the round-trip time it takes to get the incoming packet from the TNC into the computer and the "acknowledge" packet back from the computer to the TNC. The computer won't start to decode the incoming packet until it has the whole thing and the TNC won't transmit the reply until it has the entire packet, so the time spent in the serial link is significant. The internal card TNC's communicate with the computer much more quickly than the serial ones do and thus don't have this problem. Probably the best internal interface card is the Ottowa radio club **PI2** card, which can be used at data rates up to hundreds of thousands of baud, but only with an external modem. For 9600 baud, the TAPR modem works fine.

Even Faster

You've probably heard of the shared allocation we now have in the 219-220 MHz band. This allocation is divided into ten 100 KHz channels for the next tier of high-speed packet. These could be used to communicate at 50,000 baud or more. There are 30 applications for frequency coordination on these channels in Northern California. Unfortunately, most of the applicants plan to grab a 100 KHz channel and use it for 9600 baud communication, which would be a terrible waste since 9600 fits in a 20 KHz channel. I'd suggest that frequency coordinators and the ARRL deny applications unless the applicant can use the channel for its intended purpose of 40,000 baud or faster communication.

What kind of radio can you get for these 100 KHz channels? Right now there's exactly one — it's made by the Georgia Radio Amateur Packet Enthusiasts (GRAPES) and has a 10-meter output. *[Editor's note: Rumor has it that Paccomm has recently started producing modems based on the GRAPES design.]* You need to buy a transverter to operate it on 219 MHz and you probably need an amplifier for the transverter. By the time you're done, you've spent $1000. Hopefully, some less expensive equipment will become available for this mode. With this data rate and the commercially available video compression boards, digital Amateur Television becomes possible. The tremendous 6 MHz of spectrum space used for a single ATV signal today could be made to hold 30-60 ATV channels with digital quality, or some of the ATV bandwidth could be freed up for other modes.

Faster Yet

The next step is spread-spectrum, which can provide us data rates up to one megabit per second. Currently, we can get surplus part 15 equipment, but because of the current spread-spectrum rules we have to get a Special Testing Authority (STA) from the FCC to operate it. Fortunately, it's not difficult to join a group that has already been granted this STA. Most of the surplus spread-spectrum equipment was intended to go in portable wireless laptop and palmtop PCs and requires some interfacing. Most of this equipment is in our 900 MHz band and operates with less than 100 miliwatts power.

Glenn Elmore N6GN has designed an Amateur 900 MHz spread-spectrum modem that operates at 230,000 baud and is currently deployed at several stations scattered around the North San Francisco Bay area. Unfortunately, Glenn has about two generations left to go on this design before he arrives at a "transferable" design - something that could be built from a printed circuit board and schematic without the use of a captive RF engineer. Glenn has also built a simple two megabit-per-second point-to-point RF link using 10 GHz gunnplexer transceivers with Ethernet cards as the computer interface.

Outside of the Amateur Service

900 MHz

900 MHz part 15 spread-spectrum radio modems are readily available and provide data rates to at least 56,000 baud. Part 15 is a portion of the FCC rules that deals with low-power unlicensed transmitters and thus these transmitters are generally referred to as "part 15" equipment or as operating in the "part 15" service. Since these units operate on a

shared basis in our 900 MHz amateur band, we're getting a lot of interference from them. We also have to deal with the technically-obsolete Remote Location Service, which is the primary user of the band and currently restricts Amateur operations in Southern California to a very small band segment. The Remote Location Service is used to find stolen automobiles that are equipped with an anti-theft device. The advent of differential GPS and cellular modems makes their service completely obsolete, but they persist. To date, no cases of a 900 MHz part 15 or remote location-service interference complaint being resolved in the favor of a Radio Amateur have come to my attention. At least one FCC official has said on-record that Amateurs may not retain their 900 MHz allocation due to pressure from other interests.

2400 MHz

Unfortunately, most of the innovation in wireless digital communications hardware these days is happening outside of the Amateur service. Even worse, our Amateur frequencies are being taken away because of this. The ARRL recently won what I'd call a *pyrrhic victory* in the battle for our 2400 MHz band against telephone company interests by collaborating with Apple computer. Amateurs gained primary status on the band in exchange for having to share with unlicensed short-range spread-spectrum "personal communications services" (PCS). While these services are required to protect Amateurs from interference, they are not required to identify and will routinely encrypt their transmissions. Thus, it often won't be possible to identify the interfering station. Besides the low-power PCS here are three companies currently authorized by the FCC to produce higher-power 20-mile RF links that operate in our 2400 MHz band. While this means that you'll be able to get wireless technology to link together your laptops, local network, and your metropolitan area, it unfortunately will most likely raise the noise floor in our 2400 MHz band enough to make medium-distance communications impossible.

5 GHz

There are two proposals currently before FCC that would take part or all of our five GHz amateur band to set up a digital personal communications service.

The FCC has combined consideration of these two proposals into one proceeding and the first Notice of Proposed Rule Making is expected in early 1996. The first proposal, from the telephone industry's *WinForum* organization, is oriented toward wireless telephony - the phone companies would prefer to use radio for rural telephone service than to string copper wire or optical fiber. The second comes from Apple Computer and would implement a one-watt spread-spectrum service, timeshared between all users with no guarantees of throughput for any one user. The Apple proposal is to share 150 MHz of our five GHz band and to take an additional 150 MHz from an airport takeoff and landing positioning system that was made obsolete by GPS. I made an FCC filing *in favor* of the Apple proposal, because the system they propose would be usable by Radio Amateurs as well as ordinary people and because its system of time-sharing would not allow a company or individual to dominate a channel to the exclusion of individual users. If the Apple proposal flew with FCC, it might create a sort of "digital CB", which would be even more disorderly than Amateur packet or Internet, but would have interesting potential for networking operations of the sort we presently do on Amateur packet radio. In contrast to the Apple proposal, the telephony interests insist on being able to control a channel and are vehemently opposed to individuals running their own systems on these frequencies. Since the Apple proposal is intended to be a radio on-ramp to the Internet, it could be expected to have an impact on the Internet's already poor signal-to-noise ratio. How this goes depends on what the gateway stations allow.

Getting On The Air

The Bay Area has a wide-area 9600 baud channel on 145.71 MHz. The NCPA has been coordinating five more 9600 channels in the range of 145.60 to 145.70, with some opposition from the previous residents on those frequencies. The 9600 TCP/IP channel is 433.43 MHz. I've tried to operate that for a while, but with my two-watt TEKK radio I had only intermittent contact from El Cerrito with a station on Moorhardt Ridge near Fort Ross, that didn't have line-of-sight to me, and one in Hayward who couldn't decode my packets.

Obviously, we need more people to get on 9600 until we have the critical mass so that everyone has someone to talk to that their station can reach! One unfortunate problem is that a lot of people get on 9600, find there's nobody to talk to, and sell off their equipment before the guy down the street gets on the air.

I decided to solve the problem of having nobody to talk to about two years ago by building a high-level 9600 packet repeater - not a digipeater, but something that would send out packets as it was hearing them the way a voice repeater does. There are some technical advantages to having a packet repeater - you can demodulate the incoming packet to a digital signal and transmit a remodulated signal, so that you don't suffer from the analog problems of the station on the input. There are a lot of other advantages that would take me longer to explain. I never got my repeater finished. I learned something about frequency coordination and a lot of technical stuff, but I ran out of money and was a bit short on the analog RF expertise to finish the job. I'd love to see someone else take on the project and I actually have some equipment to contribute if somebody does.

Can We Keep Enough Frequencies To Have Growing Room For Future Packet Operations?

This is the editorial-opinion portion and a lot of you will probably hate me for it, but I offer it for your consideration and request that you wait for me to finish before you beat me up.

We obviously need radio spectrum if we're to carry out all of the high speed packet activities I've been talking about. We have the spectrum we need now - will we still have it in ten years?

The ARRL insists that the only way we are going to be allowed to keep frequencies over 2400 MHz is to share them. I've been working with the ARRL for about a year on spectrum issues. Although I have the greatest respect for our Division leadership, it's my opinion that the ARRL's board of directors *does not* operate in the best interests of VHF or packet-oriented Amateurs. About three and a half years ago, the ARRL had approximately 50 percent of the House of Representatives actually *sponsoring* a bill that would have preserved Amateur spectrum by law when congress ended its session. The ARRL gave up that bill, with Chris Imlay saying to me in front of everyone at the ARRL forum of Pacificon '93: "We wanted to give the new administration some flexibility in allocating spectrum. If we forced this bill, we'd never get any new allocations."

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The President's Corner

Gary Mitchell, WB6YRU
NCPA President

What's this? Another Downlink issue after so long? Sheepishly I say: yeah... sorry about that folks. I'm told that the lack of Downlink issues over the past year or so has given some people the impression that we faded away into the sunset. Well, make no mistake, the NCPA is still around! So what's the deal? We need an editor! It's as simple as that.

Allow me to introduce myself: Gary Mitchell, WB6YRU, co-sysop at N0ARY BBS. Perhaps some of you were expecting Bruce, AB6YM. He was elected president at the June board meeting, but resigned a month later for personal reasons. As the newly elected VP, the president's post then of course became my responsibility. I'd like to thank Eric, WD6CMU (NCPA frequency coordinator and Downlink typesetter) for stepping forward to fill the VP spot as I moved up.

Suddenly taking over the number one spot was something of a shock. I never planned to be president and only agreed to take the vice president's post because, well, someone had to do it.

At the June board meeting, we also elected a new editor: Roy, KA6EYH. It seemed the newsletter would finally resume its supposed quarterly schedule, so I devoted myself to coordinating the NCPA's efforts at Pacificon. Unfortunately, after a few months, Roy decided this was not the job for him and resigned as editor.

I believe the newsletter is a very important part of an organization like this. So, until we get an editor, I'm filling in temporarily. There's another short article next to the masthead describing the editor's job. Please at least think about it.

Now, about Pacificon...

For those who attended: what did you think about the NCPA table and presentations? We decided to get an extra table this year to make room for some packet demonstrations. I'm happy to report they went over well. We'll try to have even better demo.'s next year. Perhaps even something with high-speed packet.

I'd like to thank Howard Krawetz, N6HM for his packet remote sensing and control demonstration. I must confess, when Howard first offered to set it up, I didn't think much of it. Boy was I wrong--it seemed that was by far the best attention getter. Also thanks to Eric Williams, WD6CMU for setting up another packet station so people could see what it's like to actually use a BBS on the air.

The NCPA also sponsored two sessions: *Introduction to Packet* given by Bob Arasmith, N0ARY and *Packet Questions and Answers* with the following panel of packet experts (in no particular order): Bob Arasmith, N0ARY; Bob Vallio, W6RGG; Brad Watson, WA6AEO; and Eric Williams, WD6CMU. Thank you one and all!

One disappointment was that we weren't able to sell as many of our *Introduction to Packet* or *Introduction to TCP/IP* books as I was hoping. It seems most of the folks who might be inclined to get one or both already did so last year. We have quite a few copies left.

There was some talk at the last board meeting about giving a copy of both booklets to each NCPA member. However, sending them out would cost a considerable amount of money for postage. It was also pointed out that most of the members who might want them probably already have them anyway. Nothing was decided at the meeting. If any one has any ideas or comments, please let me know.

73, Gary, WB6YRU

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I suspect that the flexibility and new allocations they expected meant that the ARRL was enticed by the gift of a few kilohertz of HF frequencies into taking a much weaker stand on many megahertz of VHF spectrum.

The ARRL's recent record in maintaining our VHF frequencies is one of defeats which they have attempted to disguise as victories for their membership. The 219-220 MHz "digital" allocation isn't designed to take advantage of spread-spectrum and the "2400 victory" in which we gained a primary allocation at the expense of having to share with millions of un-identifiable encrypted stations are two examples.

In addition, the ARRL insists on one thing that gives amateur radio an extremely bad reputation among modern technical interests. Much as I acknowledge that CW is a fun and effective mode and has its place in the Amateur bands, the ARRL's insistence on maintaining a Morse proficiency requirement for all but the lowest of Amateur license classes makes Radio Amateurs look bad to the technical non-amateur public and makes that public perceive that we are unworthy of the precious frequency spectrum that could be auctioned off for money. Yet in 1994, the ARRL's board resolved to support and defend the international treaty provision requiring Morse proficiency in its representation of U.S. Amateurs to the International Amateur Radio Union, and through IARU to the International Telecommunications Union, the organization that oversees that treaty.

To regain the perception that Amateur Radio is worthy of its spectrum, we must change the perception of radio amateurs from one of key-tapping antiquarians to one of modern innovators with a primary emphasis on education. To do this, we could start by proposing a more extensive written examination on radio operating skills and operating etiquette in place of the current telegraphy examination elements, so that we could upgrade our standards for good operators at the same time we removed the telegraphy requirement. Unfortunately, FCC has been through this argument enough times that they have publicly stated that they will not consider it again. What I think they really mean is "we know how adamantly opposed the ARRL is to this, so there isn't much point in arguing." So, we'll have to change the ARRL before we make any progress on this issue.

And that brings me to my closing note. Since we have to change the ARRL from the inside, I plead with all of you who aren't yet members of ARRL to join it today and whatever you feel about these issues, make sure that Brad Wyatt, our Division Director, and Jim Maxwell, his assistant director, know how you feel.

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What's Wrong with my Packet?

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to the same deviation as the standard station.

Stations that have distortion due to excessive deviation are one of the most common problems I see for people checking into my BBS. Check the manual for your TNC for the location of the audio output control. If you can't get the audio from the TNC to go low enough to bring the deviation down to the correct level, start putting increasing value resistors in series with the microphone audio until you achieve a useful range. You'll be happy you did.

TNC Parameters

There are lots of parameters that can be set in your TNC that might affect your station's performance, and I don't have space in this article to cover them all, but a couple of them are important enough for you to check when you're having trouble getting your packets through.

The first of these is the transmit delay, often set by the command TXD. This sets the amount of time the TNC will transmit flag bits — a sort of dial tone for packet — before it starts sending the important data. This delay must be long enough to allow for the T/R delay in your radio plus the time it takes the receiver of the station you're talking to to open its squelch. For some BBSs and nodes, which may be using commercial radios with electro-mechanical T/R relays, this may be a substantial time. If you're having trouble talking to a particular station when you haven't had problems with others, try increasing the TXD parameter to see if it helps. Some connections may need a delay as long as 500ms to make them work.

You may have a good solid connection to a packet station when the traffic on the channel is light, but it falls apart as soon as activity picks up. In that case, you can sometimes improve the reliability of your connections by altering your transmission length. Reducing the size of your packets will also reduce the chances that a packet will get trashed by another transmission on the channel. The tradeoff is that it will also slow down the transfer rate, but most people would rather have a slow but reliabile connection than a fast flakey one.

On most TNCs, the command to control the maximum packet length is PACLEN. On a busy channel, like most BBS user channels, it will often help to turn this down to 60 or so to keep connections reliable. When the channel is clear and you have a lot of data to send, you can turn this up again to improve throughput.

Another parameter that may affect reliability is MAXPAC, which controls how many outstanding packets there can be at one time. For most people, a value of 3 or 4 is a good compromise between reliability and throughput. If you really have a marginal connection, you might even have to turn MAXPAC down to 1, but it's probably time to turn the radio off and go do something else if you have to go this far.

Packet radio can occasionally be a frustrating experience when things aren't working right and you don't know why. Hopefully this article will give you some more control over the quality of your packet connections and let you get the most out of your equipment. Hope to see you on the air!

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Get Creative when Setting Audio Level

It's nice to have a deviation meter for setting the TX audio level from the packet TNC to the rig, but not absolutely necessary. A close approximation to the optimum setting can be done as follows: While listening to the output signal on another rig slowly increase the drive level. You'll notice that at some point the volume stops increasing on the receiver even though you continue increasing the drive. At that point, back off a little—to the point where the received volume drops just below its maximum level. That's it! In most cases, this is just about right.

It's possible to use this procedure with someone else on the air if you don't happen to have another receiver. In this case, you have to rely on the other person's signal report. This might not be quite as accurate and it's more difficult, but it can be done.

One other option dropped into my lap recently while working someone on keyboard to keyboard packet (I forget his call). After he bemoaned the fact that he didn't have a deviation meter, I described this basic procedure. Unfortunately, he didn't have another receiver. I offered to listen and give signal reports. It wasn't very easy—he kept over- or under-shooting the mark. It would have been easier if he had another rig of some sort (HF) so we could communicate at the same time, but he didn't.

Then I had an idea: He could listen to his own signal as received on my rig using the telephone! I gave him my number and he called me up on the phone. While I held the handset to the speaker of my rig, he listened on the phone to his signal as received at my station. It work quite well. He could clearly tell when the volume of his signal stopped increasing. Sitting there, I could hear him hitting the maximum level then back off a bit—"Right there" I said. At that point, I'll bet he had it set almost perfectly.

I thought this whole thing was pretty nifty, and so did he!

The moral to the story: Be inventive and help each other out. That's part of what amateur radio is all about.

Gary, WB6YRU

The Beginning of NTS/Packet in California

[Editor's note: Here is the third and final of three parts (recovered from our previous editor). The material was originally from Don Simon, NI6A, and is told by various people. The previous installment pretty much discussed packet in the mid 1980's. It seems the last part ended in the middle of a sub-section entitled: **1985 and the Great Path South!** *The story continues...]*

Both W6IXU and NI6A were surprised to find each other talking on packet that weekend, as they had talked many times before handling NTS traffic using high speed CW on RN6 (the Sixth Region Net) and PAN (The Pacific Area Net). Both reaffirmed their dedication in getting packet to work for NTS; and Mike launched his plans for a BBS that could be accessed via both Northern California and Southern California packeteers as a NTS Clearinghouse BBS.

Within a few weeks W6IXU had his BBS going on 145.01 and had implemented NTS help files and functions allowing the killing of third party traffic. NTS operators from SCN and SCN/SB (Southern California Net and SCN/Santa Barbara) were picking up Southern California traffic and operators from Northern California Net (NCN) checked in for Northern California traffic. Out-of-State traffic was picked up by liaison stations to the Sixth Region Net. By the Summer of 1985 over 200 NTS messages per month were being handled at W6IXU BBS in Arroyo Grande including providing much communications and Welfare traffic in the great fires of the summer of 1985 where over 500 DWI NTS messages were handled within a one month period on packet. It was not until six months later that *automatic* forwarding of NTS traffic between Northern and Southern California could be arranged although it was already being accomplished from Northern California to the rest of the USA via the W6CUS-1 HF GateWay BBS on 14.103 MHz and 145.09 MHz.

The First Solar Powered Digipeater at 9,000 Feet

By early Spring of 1985, WA6RWN had "effectively" the first solar powered high level digipeater running ten watts at 9,000 feet above Visalia linking much of the Fresno Valley. In strict terms, this wasn't really a 9,000 foot digipeater (although in functional terms it was). The radio equipment was a 9000 foot full duplex remote link to WA6RWN's home in Visalia and the actual TNC (lent by K6VCO for the original WestNet "network" as per the first WestNet Meeting) was down the mountain at the home QTH. Thus Bakersfield, Fresno, and most of SJV section were linked into the growing network. Shortly afterwards the burgeoning "network" was joined by W6BXN-1 digipeater at 5000 feet above Merced serving the Northern part of the San Joaquin Valley all the way into Sacramento.

A Good System Attracts Users Like Molasses Attracts Flies

The W6AMT group had ambitious plans linking all the way through Oregon and further but various loading problems due to limitations in software, baud rate, time, and resources as well as user interface problems slowed down further rapid expansion. Continual site problems at W6AMT-1 frequently cut the link to W6IXU BBS and to the South preventing the flow of all traffic including NTS traffic especially frustrating the North South link for Thanksgiving through New Years in late 1985.

W6AMT-2 went up at 4000 feet on Santa Ynez Peak on April 13, 1985 providing a more reliable link from W6AMT-1 to the L.A. basin. This was quickly followed by W6AMT-3 at 1500 feet in Palos Verdes, W6AMT-4 (now AA4CD-1) above San Diego at 2565 ft, W6AMT-5 on Santiago Peak at 5696 ft and W6AMT-7 in Northern California at Mt. St. John at nearly 7000 feet; thus effectively linking Northern California from the Oregon border to the Mexican border by the years end. WB6RAL replaced NI6A as PPRS packet frequency coordinator by late 1985 and attempted to increase the efficiency of the system.

As new users arrived in the great packet explosion of 1985, the loading increased; and frayed nerves were not uncommon. Bearing the brunt of the complaints as the "big frequency pigs" were "the BBS" and some polarization and dissension within the packet community was difficult to prevent between some "BBS" users and "rag chewers."

Not wishing to further aggravate this divisive polarization, the new generation of BBS's that emerged in Northern California decided not to further polarize the situation on 145.01 MHz. It was recognized that for a network (no matter how elementary) to exist for BBS forwarding (and thus NTS traffic forwarding); it could not occur without these high level digipeaters. The "network" had to come first and be nourished. Then it was hoped that room would be made for BBS linking as well (a hope nourished by the 2nd WestNet Conference).

WestNet II

As mentioned previously, the Fourth ARRL Computer Networking Conference met on March 30, 1985 in San Francisco sponsored by PPRS. PPRS also sponsored the 2nd WestNet Conference held that Saturday Night. Over 40 packeteers from all over WestNet attended as well as representatives from CAPRA, FADCA, RMPRA, TAPR, and SCDCC. The meeting was organized and hosted by NI6A on behalf of PPRS and chaired by NK6K. There again were laid ambitious plans to link Northern and Southern California, this time via high speed 220.90 MHz dual port nodes using K9NG 9600 baud modems and Xerox 820 dual port digipeaters (utilizing Xerox 820 boards based on ARRL laboratory design led by KE3Z). Conferences between the developers were to be handled on the WestNet (on W6IXU BBS).

RF deck problems were identified as such narrow (voice width) I.F. bandwidths, frequency stability, slow relay switching, and high level site problems were discussed. In the ensuing months KA6SOX, WB6YMH, WB6ASR and WB6RAL worked in attempting to solve the many Midland 13-509 RF deck problems presented by high speed data transfer. WB6WEY, produced a new ROM chip for the Xerox 820-1 dual port digipeater to enhance its operation (although question was brought to a Xerox 820's suitability at high altitudes). No one was able to come up with a workable PIN diode switch modification for the Midland 13-509s or any other available crystal controlled radio. Development was slowed. Overcrowding became worse and growing pains were felt. W6IXU designed a new "network switch" standard that would be compatible for high altitude use and future growth; but no consensus could be

reached. TAPR at this point began work on the Network Node Controller (NNC) which is still in the development stage.

Although the high speed network still hasn't been achieved (mainly due to RF deck development and high speed modem interface problems); it took nearly two more years for the 220 MHz backbone network to arrive; and the plans for that occurred at the 2nd Northern California Sysop Association meeting, also at the Richmond Red Cross in December 1986...but we are getting ahead of the story....

BBS Linking in NORCAL 1985

Between the Springs of 1985 and 1986, much more happened on frequencies other than 145.01 MHz. KA6M-1 BBS was going through its death throes by the time of the 4th Annual ARRL Computer Networking Conference came to San Francisco sponsored by PPRS. Northern California's second BBS had just been born at the Palo Alto Red Cross through the efforts of N6FQR, Bill Danielson, and Ted Harris, N6IIU. The call sign was WB5VUL (later changed to N6IIU-1) and the frequency was an empty 145.09 MHz. The computer was a Xerox 820-1 running the now famous WORLI BBS software. Although there was no digipeater on this frequency and the BBS was "down" more than "up," the need for a working Northern California BBS was more obvious than ever.

With the help of N6FQR, the East Bay Packet Radio Association in conjunction with the East Bay Amateur Radio Club and the Richmond Red Cross, W6CUS-1 BBS was placed into service on 145.09 MHz in the Summer of 1985. The following week, EBPRA put up WD6CMU-1 digipeater on 145.09 MHz at 1000 ft in the Berkeley Hills that linked San Jose to Santa Rosa to a single BBS! UUCP, HamNet, DRNET, and other electronic news services were ported to W6CUS-1. The HF gateway second port was added late that same summer, finally providing a link to the national packet radio system from Northern California via the W6CUS-1 VHF gateway on 14.103 MHz and 145.09 MHz. Now Northern California was only one year behind the East Coast and gaining!

Within a month, WA6NWE-1 BBS joined the link from Sacramento using a Xerox 820-1 BBS as well as an ingenuous digipeater link via N6IJP-1 (the world's first wandering digipeater). WB5VUL moved to 145.07 MHz; but through a creative control system engineered by N6FQR, it came onto 145.09 MHz between midnight and 6 AM to forward with W6CUS-1. Shortly afterward, Roy, AA4RE, began experimenting with the beta test release of WA7MBL's version 1 IBM emulation of WORLI's Xerox 820 BBS software and Roy joined the linked Northern California BBS system via wb6zvw digipeater on 145.09 MHz. Bulletins were entered on W6CUS-1 and then copied for the other BBS. At that time there was no software to support forwarding the same bulletin to more than one other BBS. Automatic forwarding and distribution based on designators was to come a long way and it is still a very "hot" subject as we enter 1989.

Thus Northern California was suddenly linked for automatic message forwarding from Sacramento to Gilroy on VHF and nationally via the HF gateway at W6CUS-1. NTS traffic was now being forwarded nationally in and out of the State. Southern California bound NTS traffic was taken from W6CUS-1 manually by assigned NTS liaison stations to W6IXU BBS on 145.01 and dumped. Southern California Net (SCN) stations then checked W6IXU daily for SCN traffic and dumped their Northern California Net (NCN) bound traffic and picked up the SCN traffic.

At that time, the entire national BBS linked system (linked by a series of HF/VHF gateways and VHF BBS) numbered less than 50, with less than 20 on HF. Those with big signals on the West Coast at that time were W9ZRX, K0HOA, W5XO, KC0QJ, K7PYK, AD8I, KR5S, and WORLI. Hard to link with was WB7DCH in Seattle, as he always had his beam pointed East (90 degrees from the Bay Area).

Northern California Sysop Association Meets

A similar situation was occurring in Southern California with KD6SQ-1 BBS in Rancho Cucamonga, also running the WORLI BBS software on Xerox 820-1 as a dual port HF/VHF gateway BBS with the vhf forwarding occurring mostly on 145.36. By September 1985, the Northern California Sysop Association was formed at a meeting at the Richmond Red Cross attended by every packet BBS sysop in Northern California from Clovis to Sacramento. Input was received from KD6SQ and W6IXU (from Southern California) as well. Plans were made for automatic forwarding designators, bulletin distribution, new digipeater links, backbone linking, emergency communications uses, NTS traffic, BBS enhancements, user education, etc. N6FQR wrote the first modified hard disk BIOS for the WORLI BBS to work on the Xerox 820-1 allowing W6CUS-1 by late 1985 to operate the first WORLI Xerox 820 BBS hard drive system.

WORLI BBS on The IBM PC/XT by WA7MBL

By late 1985 the first releases for general consumption of the WORLI BBS look alike for the IBM PC was made available by WA7MBL. No longer had a potential sysop need hack with a "challenging" Xerox 820-1. This, combined with the rapidly falling prices of IBM PC/XT Clones contributed to the quadrupling of BBS's across the country within six months. Again off-the-shelf technology provided the great impetus for the event. No longer did people need to go DX BBS'ing to find a bulletin or read their mail. There was a "linked" BBS in their own back yard with all the news, hopefully on a channel with less congestion.

Automatic Forwarding Between NORCAL and SOCAL, 1986

In early 1986, the first automatic forwarding between Northern and Southern California was achieved when KE6BX BBS joined the Northern California Sysop Association and linked Arizona and Southern California BBS systems to Northern California utilizing the then only linked vhf channel 145.01 MHz by instituting a BBS port on 145.01 MHz to WB7BNI, KR5S, N5EDH, and later to N6LUC (replaced by NK6K-1) and later W6IXU BBS. Jim's second port was on 145.09 MHz to AA4RE-1 BBS who was linked on 145.09 MHz to the rest of the Norcal BBS thus completing the automatic forwarding chain from Northern Texas, New Mexico, Arizona, Southern California, and finally Northern California.

Within a month W6IXU modified his software to be able to forward compatibly with the WORLI forwarding system on 145.01 MHz. In order to keep loading reduced, forwarding was restricted to 1 AM to 5 AM. 1986 was the year of the BBS and the year of the digipeater expansion, and also a year of excessive load-

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ings and the frustration of packet growing pains.

When this elusive North/South automatic BBS forwarding link finally occurred. W6CUS-1 BBS was moved to 7093 KHz to take advantage of the long 40 meter band conditions created by the 1985/86 winter sun spot trough where 20 meters was closing as early as 5 P.M. KD6SQ-1 thus was able to serve as California's sole 20 meter access point and be able to forward through a series of BBS to Northern California while W6CUS-1 forwarded on 40 meters providing a nighttime link into the State as well. At that time, 7093 KHz was bustling with BBS activity with such BBS's as KC0QJ, K7PYK, KR5S, N5EDH, W5XO, AD8I, W9ZRX, and many East Coast BBS's as well.

In an attempt to mollify the division caused by a few that would blame the loading on those "wordy" BBS's, the PPRS proposed a packet band plan after frequent questionnaires as such. Frequencies 145.01, 145.03, 145.05 144.91 223.56 MHz were users only, no BBS forwarding. Frequencies 144.93 (when vacated), 144.95 (when vacated), 144.97, 144.99, 145.07, 145.09, 223.58, 223.60 MHz were to be BBS only. Unfortunately this solution was not accepted by all and much "controversy" ensued. The fact was that the frequencies were over-loaded because of lack of cooperation in pooling resources to create a backbone. The user uplinks and downlinks were on separate frequencies. The linking frequency was overlooked by most. This was a simple and applicable networking concept to ham radio; but the bickering over who was to blame for "interference" soaked up more of our energies than it would have taken to build the needed backbone. Many good resources and potential helpers were lost and/or gave up in disgust.

But between the time of the first automatic NORCAL/SOCAL BBS forwarding in early 1986 and the formation of the backbone a year later, much more occurred in 1986.

FCC Docket 85-105: Automatic Control of Packet

A severe blow to BBS linking occurred in late Winter of 1986 when the FCC approved Docket 85-105 prohibiting automatic operation of packet below 29 MHz. After some heated debate, it was decided to remove W6CUS-1 from automatic operation at the Richmond Red Cross until a control link was installed or the FCC responded to a number of petitions for reconsideration. W6CUS-1 was temporarily QRT on HF for another month until the 440 MHz remote control link capable of removing power selectively from any of the transmitters and capable of separately resetting the TNC's and computer was engineered and installed by WD6CMU. Even so, the EBPRA board voted to activate HF forwarding files for outgoing HF traffic only when a control operator was present. This situation changed only when the ARRL Special Temporary Authorization (STA) to the FCC was instituted in late 1986. Two of the original 22 applicants on the STA were W6CUS-1 and N6EEG, the two EBPRA HF gateways. Coming back on HF after the one month absence, the sysop's at W6CUS-1 noticed that the 40 meter net was severely diminished and never did regain its previous strength in the aftermath of FCC Docket 85-105. Many BBS sysop simply pulled the plug and gave up trying to provide the service of HF gateway at extreme sacrifice in terms of time and money. It seemed that most felt it was absurd to have to sit in front of the BBS continuously as a control operator watching for FCC violations if and when the HF port was active.

The Northern California Floods (Winter 1985-1986)

Amateur radio packet mailboxes and digipeaters played a vital role in providing information nationwide on the welfare of lost families and friends during the devastating floods of February 1986 in Northern California. Hardest hit were Napa, Sonoma, Solano, Sacramento, Yuba, and Sutter Counties, where the President declared a State of Emergency. Amateur radio operators worked 24 hour shifts, many into exhaustion to provide what was in many cases the only communications in or out of flooded and isolated towns. All have sacrificed and given a service to their community without compensation other than the knowledge that they performed a service that no others could provide when it was needed the greatest. These radio "communicators" in the highest sense of the word have our highest esteem for their humanitarian effort. Packet radio was used throughout the flooding in most of these counties providing direct communications with State Office of Emergency Services packet operations located at State RACES Headquarters near Sacramento as well with the California Department of Forestry and Fire Prevention, The American Red Cross district, and command Headquarters, as well as various Red Cross Chapters.

Normally, only when the Emergency communications needs diminish because of the establishment of telephone services does the Disaster Welfare Inquiry (DWI) traffic begins to be released by the Red Cross when families and friends who have been worrying about the victims can be notified of their fate via this important service. Such service is often delayed because of unavailable telephone lines, the overworking of already fatigued amateurs, and the lack of volunteers at the disaster sites to organize such a service in a timely fashion. However, in this disaster a new element was added thanks to a lively Sacramento Packet and ARES group and also to the willingness of the American Red Cross to attempt something new.

On February 20, NI6A was contacted by N6DRT, who was then Chairman of the Communications Advisory Committee of the American Red Cross Western Operations Headquarters, ECAC member from the Pacific Division and a member of the DWI Task Force at Western, to see if a packet DWI system could be setup to service the flooded chapters. By February 21, despite lack of telephone service, we had established liaison with Napa, Sonoma, Solano, and Santa Cruz Red Cross via ham radio. The plan was to have stations check into the NI6A-1 mailbox located at the Richmond Red Cross twice a day to look for DWI outgoing traffic for their chapters that would be entered directly from W6MLK located at the Red Cross Flood Headquarters for Northern California at the San Francisco Red Cross. Since this was the first time the DWI teams had interfaced with packet digital systems, there were some major start up problems at the Red Cross to overcome; but the experience was edifying for everyone.

Some of the major problems at the Red Cross Disaster HQ were: 1) Obtaining a computer 2) Obtaining a word

processor program that could output ASCII files. 3) Training personnel in word processing 4) Entering the data from telephone and TWIX inquiries. 5) Assigning DWI inquiry numbers.

In short, we found that the data entry process exacted a major portion of the start up time. The packet operator at San Francisco Red Cross simply ran a standard communications program on the same computer and was able to upload the files twice a day to the NI6A-1 BBS located at the Richmond Red Cross, taking less than ten minutes a day. This same operator would also receive replies this way at the same time (twice a day). Ideally, we would have preferred a BBS at the Red Cross Headquarters connected to the network 24 Hours a day. A second computer could have been set up dedicated to word processing. Files could have been copied to floppy disks and taken to the BBS located in the communications room, where the sysop could convert the files into messages.

More ideally, an integrated database program could automatically keep tabs on all inquiries and generate outgoing messages at the same time. No such software existed at that time and all such proposals to fund such a system has been subsequently turned down by National HQ.

Further improvements would include being able to output all TWIX data directly through the serial port into a computer database, or to avoid TWIX altogether and be able to receive all inquiries via national digital data networks (either ham packet, telephone, or satellite).

On the packet radio end, the main problem was to establish reliable RF paths to the Sacramento area. Never the less, the RF paths managed to hold tight, so that delays on packet were not longer than 4 hours at its worse which is adequate for DWI traffic. This has since been rectified now that many redundant paths are established throughout most of Northern California.

The first Sutter and Yuba County DWI traffic was put on the NI6A- 1 mailbox at 4 PM on Sunday February 23 and 25, replies came back via this same mailbox by 2030 PST that same day! This hailed in a new era where DWI traffic could make the rounds even while telephone service into the area (Yuba County in this case) was nearly impossible.

In all, about 300 messages were handled on packet. Although Sacramento, Yuba, and Sutter used packet for replies, the other chapters either could not handle DWI replies or they were able to eventually use the telephone in the replies after that service was restored. Most of the chapters in the stricken areas did not have even one computer. Where there was an IBM compatible computer, the packet operator took the inquiries from his home station and dropped off a floppy disk to the Red Cross Disaster Headquarters. Where there was portable packet at the disaster headquarters, disks were directly handed over to Red Cross personnel and/or hard copy print out and handed to Red Cross workers. Obviously on the receiving end, it would be optimum to have a database system that could directly receive DWI inquiries with a standard format; but none existed.

Packet offered decided advantages over older systems. It was error free and fast (1200 baud). It did not require recopying the messages by hand at each node and thus was less fatiguing. While the old system was run with TWIX machines at 110 baud and required to be retyped again into a database, packet zoomed in at 1200 baud and could be integrated with existing computer databases and could be relayed and sorted without retyping. But one of the greatest advantages of packet was that it didn't needlessly tie up valuable and rare communications personnel. By using the mailbox as the carrier method, we avoided having to tie up operators at any one time or frequency and allowed them to check the mailbox at any convenient times they had. Messages and updates were left, and inquiries and replies were left and picked up. The Red Cross crews were also freed up to work flexible hours, thus traffic was allowed to flow without making any great demand on personnel schedules nor interfere with higher priority traffic. The path was adequate on 145.09 for all the flooded counties except that it was marginal for Sacramento and Yuba due to heavy loading in the San Francisco Bay region; so some traffic was forwarded from NI6A-1 to WA6NWE-1 mailbox in Sacramento which is also on 145.09 MHz.

Much more could have been done and much faster too, as is usually the case. One must say that the Sacramento, Yuba/Sutter DWI teams were the best prepared that I have ever encountered previously. The Sacramento ARES packet operators were the most skilled, knowledgeable and best equipped, and their many months of packet experience really showed through when the job needed to be done. Besides providing this service, the experience has further solidified the relationship between packet radio and the American Red Cross, and hopeful now has created the groundwork for an integrated DWI plan utilizing packet radio and highs-speed telephone modems and computer database programs integrated with communications ability.

Certainly there were many disaster operators that will be missed, but thanks are due to these packet operators who worked so hard to make this pioneering effort work: K6RTV, K6QIF, WA6NWE, K6PWA, WA2AGE, WA6LZO, W6CFG, N6ECT, KE6CD, KG6VH, WB6PMS, N6DBZ, W6LRT, W6LKE, KX6Z, et al.

California HF Gateway Growth

By the winter of 1986-87, things looked very rosy for HF links out of Northern California. W0RLI had moved his BBS to Boulder Creek and set up shop on 14.109 MHz. N4CHV put a HF/VHF gateway on 14.111 MHz. WB6ASR formed the first reliable Australia and Hawaii forwarding to AX4BBS and KH6WY, KH6GPI and then later to AH6GJ on 20 meters. N6EEG linked with the 10.147 MHz BBS network and KD6SQ-2, located at the Riverside County OES joined W6CUS-1 and KE6BX (later replaced by W6PW-3) on 7093 KHz to form a much needed "reliable" path for Southern California forwarding as the VHF path was still subject to frequent long term failures. By this time, WB6KAJ had taken over for KD6SQ-1 on 14.109 MHz as the prime 20 meter Southern California HF gateway.

1977, The Year of NET/ROM Wormhole

In early 1987, KE6BX agreed to remove his BBS from the 145.01 MHz "user frequency" when the 220 MHz forwarding system became functional. At the same time the W6AMT group was then first Alpha testing the Net/Rom software developed by W6IXU and WA8DED. Net/Rom allowed packeteers many advantages. As a network controller it allowed acknowledging between nodes rather from end points, thus

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making long distance links much more reliability and causing less loading. It allowed automatic routing between nodes (it found the best path to the end node automatically for you). Another important feature was the multi-port capability of receiving on one channel and transmitting on another frequency, thus greatly enhancing long distant "backbone" type networking. Net/Rom provided significant help on a saturated 145.01 MHz and a frustrated packet community when it first appeared in January 1987 on the W6AMT sites as an alpha test.

Plans were formulated then to have a dual port two meter and 223.58 MHz via Net/Rom at many new and old high level "node" locations. By February 1987, Net/Rom was operational between Northern and Southern California via the W6AMT system and was quickly installed on the 223.58 MHz backbone by early March, 1987 on the W6AMT 220 MHz system as well. The 220 MHz Backbone

Eventually the advent of Net/Rom and the 220 MHz backbone in early 1987 were to contribute significantly to channel decongestion and to ameliorate frustration. Even as we enter 1989, a higher speed super backbone is yet to be agreed upon, although badly needed. We still today need user uplink and downlink frequencies that are separate from the long distance link frequencies, thus insulating user nodes from other user nodes on the same user frequency. But here again we get ahead of the story.

It was not until almost a year later in the early winter of 1986-87 at the 2nd Northern California Sysop Association meeting at the Richmond Red Cross, that it was decided to take all BBS linking off of 145.01 MHz (and all user frequencies) and do the forwarding on a 223.58 MHz backbone. W6AMT 223.58 MHz port was put up around New Years 1987 and subsequently Net/Rom was installed there changing the call sign to W6AMT-10 on March 9, 1987. EBPRA put up WB6BDD-10 digipeater on Mt. Diablo, also on 223.58 MHz in February 1987; thus allowing Sacramento, the San Francisco Bay Area, Monterey Bay, and the Gilroy area BBS's to forward amongst each other on a separate frequency from the user frequency. This avoided many heretofore "unavoidable" hardships. The "backbone" was thus born, eventually linking into Southern California via W6AMT-11 (Net/Rom installed on Feb 21, 1987), W6AMT-12, and to the East Coast via the wormhole. WB6BDD-10 was moved to Mt. Vaca a month later and the call sign changed to WA6RDH-11, thanks to the help of the Sacramento Radio Club and WA6RDH for the site and maintenance and PPRS for the TNC. Later, Net/Rom was installed at WA6RDH-1, WA6RDH-11, and WA6RDH-12 on 145.01, 220.90, and 223.60 MHz respectively helping create a tierred backbone system in conjunction with the fantastic work done by N7EQN, N6IYA, and the W6AMT group. By the summer of 1987, N7EQN-10, N7EQN-11, and N6MPW-1 were put up on at Castle Rock as a triple-port Net/Rom node on 220.90, 223.54, and 145.09 respectively. Later another triple port Net/Rom node helped form yet another BBS LAN on 223.58 MHz by the combination of the Garlic Packet Radio Society and the W6AMT group tieing together: W6AMT, W6AMT-10, and N6JQJ-10 on 144.93, 223.58, and 220.90 MHz respectively. The triple port Net/Rom nodes allowed for greater efficiency and throughput for BBS forwarding where BBS's were no longer uplinking directly on the backbone, and the "hidden node" problem on the main backbone was finally eliminated. But we again get ahead of our story.

The Wormhole

On January 7, 1987, a TNC was put on 145.01 MHz at VitaLink in Mountain View with the call sign of WA3YMH-1. At the same time, a TNC and radio was installed in the Washington D.C. area on two meters with the call sign of WA3YMH-1. An audio connection was made between the two TNC's at each end via a full duplex 56 Kbaud satellite link utilizing a previously unused VitaLink commercial satellite channel. It was WB6ASR who made the first over the air contact across to Maryland that same day via W6AMT, WA3YMH-1.

Thus what was affectionately called "the wormhole" was born. This link was eventually placed on the 223.58 MHz backbone and fitted with Net/Roms with the call signs of WB6FFC for the "Westworm" and WA3YMH-1 for the "Eastworm." Most of the work was accomplished at the VitaLink Headquarters in Mountain View, California by Mike, WB6FCC and Brian, K6OYM. By the time VitaLink moved to Fremont (taking the wormhole with it); it was already on the 223.58 MHz backbone as a dual port Net/Rom node.

The West Coast and East Coast were now linked together on VHF via one hop. Of course, it took little time for the BBS sysop's to figure out that East/West traffic could be forwarded over the wormhole. N4QQ, W3IWI, W0RLI, WD6CMU, AA4RE-1, W6CUS-1, and later WB6ASR BBS made good use of this new one-hop path that linked the nation. The wormhole died almost a year later after helping the HF linked BBS systems get over one of the worse sunspot cycle troughs in history.

Net/Rom truly revolutionized packet development in California and the nation. It coincided nicely with the development of the backbone idea, where the user and linking frequencies are separate. But the subject of Net/Rom and networking expediencies is yet another subject and we are getting ahead of our history. If 1986 was the year of the BBS and digipeater linking then 1987 was the year of Net/Rom and the wormhole.

By the Summer of 1987 most of the 220 MHz systems and many two meter systems throughout California and the world had sprouted Net/Rom, developed and manufactured by W6IXU and WA8DED.

The WD6CMU White Pages

By the third Northern California Sysop Meeting (in the Spring of 1987 at the Palo Alto Red Cross), WD6CMU BBS was running a multi-channel multi-connect BBS with the ability to receive personal messages and automatically copy them, then send them out as bulletins with altered "@" field designators, thus allowing bulletin distribution to fan out from a central switch through a branch distribution system. Some of these features were later incorporated in W0RLI BBS software. After an extremely heavy year of operation, WD6CMU BBS no longer had to be the central bulletin switch for Northern California as W0RLI had written software to distribute bulletins, change designator fields, and check for duplicates.

However, Eric, WD6CMU, then took to task what he later coined, the "White Pages" project; a nationwide database that can automatically look up any call sign requested and automatically provide the home BBS and zip code with a return message. Any user today may simply send a message to WP @ WD6CMU requesting the home BBS of any user using the simple formula:

```
sp wp @ wd6cmu
any title
callsign qth?
^z
```

Additional call sign requests may be included before the Ctrl-Z. This message would be automatically forwarded to WP @ WD6CMU which automatically reads the message, looks up the answer in its database, and issues a reply message back.

The advantage of this global WP database is that anyone's home BBS may be determined automatically.

New information can be sent to WP @ WD6CMU in a similar format:

```
callsign qth BBS-call
^z
```

Later, W0RLI incorporated a feature in his BBS code that asked each user their home BBS, zip code, etc. This information was also forwarded on to WP @ WD6CMU as it was the only BBS capable of storing this data and answering inquiries automatically.

Quite a bit later, W0RLI BBS had the option of answering a query to WP by keeping its own database answering system. If that BBS didn't know the QTH of the query, it would be passed on to WD6CMU or another regional WP server until the answer is ascertained. If WP @ WD6CMU (the global server) doesn't have a listing it will send you back a message saying "Sorry, no record." This is where the data goes when your BBS asks you for your home BBS or if you enter it with the NH command.

1988 Packet Racket

It was not until 1988 when the 220 MHz backbone systems were just beginning to flourish that the FCC dealt the promising and growing Packet Radio system its second big setback: the loss of 220-222 MHz. But then again, 1988 gave us the "molehole," affectionately called because of the lack of digipeaters. A BBS in Oregon stated "if you can't go over Oregon, you can go under it," or so the saying went. The molehole was a commercial audio link (PC-Pursuit telephone line) between Seattle and San Jose with TNC's on both ends. This was one of the many efforts by Scott, N7FSP.

Packet BBS Software in the West

W6IXU, in Arroyo Grande, California created the first packet BBS software allowing multi-connects on the same frequency operational by 1986. Soon afterward WD6CMU, in Richmond, California wrote BBS software to accomplish the same task as well as to let users run programs, games, etc. In 1988 AA4RE in Gilroy, California is distributing his BBS software for the IBM PC/XT to also allow multi-connect on the same frequency and also function as a compatible W0RLI BBS. It seems that the West is now leading the way with multi-connect BBS software for whatever the reason. One thing for certain, it sure is nice never to get a "busy" from a BBS when you want to get in and take care of some business.

Super Connectivity: N6VV Super BBS

Perhaps one of the greatest boons to California packeting, as far as efficiency goes, occurred when N6VV BBS in Pleasant Hill answered the challenge of becoming a SkipNet Teleport STA Station shortly after the wormhole closed. In the beginning of California linking, all out of state packet forwarding was done via HF gateways, (only later did some of the out of state VHF links become established). The first gateway HF BBS's were not too fancy. At first W6CUS-1 only had a dipole pointing East and 100 watts (only after it moved off of 20 M did W6CUS-1 get its 4 element tri-bander and KW amplifier). KD6SQ-1 was a little better with a 3 element tri-bander. This was the deciding factor why W6CUS-1 moved to 7093 KHz for California linking and KD6SQ-1 stayed on 14.103 MHz after the North/South VHF BBS forwarding link was established. Later, W0RLI moved to Scotts Valley, together with N6EEG (another EBPRA HF SkipNet gateway station) and W6CUS-1, were all designated as the original "FRISCO" Teleport for the ARRL STA request to the FCC for automatic packet operation on HF.

The original ARRL application tried to describe an average SkipNet station as having at least a 10 DB gain antenna on more than one HF band at a time. They were capable of automatically changing bands given changes in propagation and to feed HF regional gateways on longer wavelengths while simultaneously feeding longer range gateways on frequencies close to the MUF. These stations were also supposed to have their transmitting facilities far removed from their receiving facilities, but linked via UHF or microwave to the BBS (Computer and TNC's). At that time, this was not a practical criteria and with other requirements, were eventually changed. We were happy to get any HF BBS; one with any sort of beam and a decent dual port system was gratefully accepted. Coast to coast messages usually had to take "rest stops" in Colorado, Indiana, and/or Ohio before making the Atlantic Coast.

However, that was in 1986. Today, N6VV provides WestNet, the HF gateway support of 7 element monoband beams at 80 feet with a KW output on 3 separate HF Bands. N6VV even has a beam for 40 meters. Needless to say, throughput to the East Coast and mid West has increased considerably with the advent of this BBS. Hopefully, we can continue to replace inefficient HF gateways with stations better suited to the ever increasing amount of data being passed through amateur packet networks coast to coast. N6VV BBS is now relaying approximately 200 messages per day. With a few more stations like N6VV on HF, we will have some very good coast to coast and international turn around times for packet messages.

NCPA Editorial

During 1988, the Northern California Packet Radio Association held their first organizational meeting at Contra Costa County Community College in San Pablo. The meeting was sponsored jointly by East Bay Packet Radio Association, East Bay Amateur Radio Club, and the Northern California Sysop's Association. If you were wondering why traffic isn't moving, why there is congestion, who it is that has engineered what we have today in packet, then you should get involved with NCPA.

Many things just don't get done because those who are doing them just don't have time to ask for help. It's sort of like the guy with all ten fingers plus his tongue in the leaky dike trying to keep the ship afloat. He doesn't have a free mouth or finger to ask for help. Modems have to be built, nodes put up, projects funded, redundant systems installed, and

Continued on page 14

The Beginning of NTS/Packet in California

Continued from page 13

lots more jobs require DOING and FUNDING and YES WE AIN'T DOING A FRACTION OF WHAT NEEDS TO BE DONE OR COULD BE DONE; BUT things don't get done because the resource pool is limited; and nerves get short circuited under those circumstances and the resulting casualties take their toll. If you'd like to help, join NCPA. At least you can pay your dues and help fund some of these projects; but we would like to see you take part in an active manner on any of our projects from frequency coordination to technical development; from education to database maintenance, etc. Things can get done if we pool resources, optimize existing technology, and plan for a better future. If we focus on the common goal united we will accomplish our purposes faster, which appears to be moving data more efficiently. Restated, it is to communicate more efficiently (faster, more accurately and more reliably). Perhaps the establishment of NCPA is the greatest achievement in 1988 toward improving future packet radio communication in and out of Northern California.

So before putting up a BBS on a frequency or a Net/Rom node, or if you have resources or skills that may be able to help "the cause," contact the NCPA.

NTS and Packet Radio

The preceding history of packet was to present the stage to explain NTS packet development. NTS packet has and always will simply ride on the tail of the "packet dragon" and hope that its leadership will always provide for third party traffic service. It has depended greatly on the good will of the HF sysop's who do the long distance transportation and whose efforts are considerable once one understands their daily tasks. It's efficiency and final form will be governed by how well it is able to understand and be integrated into this vast technological development. Packet on the other hand will be judged on its ability to provide a valuable function for the public especially during disasters. NTS and the other ham public service organizations are looking toward packet to solve many problems and are thus helping support its technological and rule making developments as best it can.

NTS/PACKET History

Now that California was finally linked nationally, bulletins, messages, and NTS traffic could finally flow, but the quality of this flow has always demanded improvement. Designators for NTS traffic was first taken up on the East Coast as early as 1984. By 1985 NTS traffic was being sent NTSXX (where XX was the state abbreviation) @ BBS callsign. But which BBS could handle a specific NTS message? There were many problems.

The main problem was that BBS sysop's were not necessarily aware of NTS. NTS operators were mostly packet illiterate. Sending NTS traffic to a BBS simply because it was in the right state or closer to the right state than the other BBS did not accomplish anything. Many HF BBS's were limited in VHF linking within their state. Some were virtually isolated and had only a local VHF user base with no NTS operators at all. It became obvious that NTS traffic should only be sent to BBS's that could act responsibly toward this traffic. If they had no NTS liaison who could bring the traffic to a NTS net or if they could not forward the traffic to designated State NTS BBS then such traffic should not be sent via packet or it would be lost or delayed, which of course was counter productive.

History:

Northern California AX.25 Packet Network (NCXPN) is a special interest group (SIG) within the Northern California Packet Association (NCPA). Because the NCPA is dedicated to resolve problems facing the packet radio community in Northern California as a whole, it has traditionally not been able to expend the time or resources necessary to effectively help development on any single special interest groups, such as the DX Packet Spotting Network (DXPSN), TCP/IP, BBS, Keyboard to keyboard users, etc. Hence the creation of NCXPN prior to the last NCPA general meeting, occurred in order to target specific development projects that required attention in the areas of AX.25 linking and use, and more particularly but not limited to, BBS and Net/Rom nodes.

[Editor's note: Late breaking news... The NCXPN (BBS sysop's) just changed their name to: the Packet Sysop's of Northern California, PSNC]

The Pacific Packet Radio Society (PPRS) begun in 1981 by Hank Magnuski, KA6M, who created the world's first digipeater. PPRS was a large and active group of experimenters and predominately technical in nature. In 1984, Tucson Amateur Packet Radio (TAPR) made available the first packet TNC in kit form. Shortly after "USERS" appeared on the scene.

East Bay Packet Radio Association (EBPRA) put up the first HF/VHF gateway BBS in Northern California in the summer of 1985 running a Xerox 820 computer and W0RLI BBS code at the Richmond Red Cross under the call sign of W6CUS-1 on 145.09 MHz. A week later EBPRA put up WD6CMU-1 digipeater also on 145.09 MHz located 1000 feet in the Berkeley hills and linked what was then the only active BBS in the Bay Area. Within a couple of months, we were joined with other Xerox 820 BBS on 145.09 MHz, WA6NWE-1 in Citrus Heights sponsored by SACPAC, N6IIU-1 BBS at the Palo Alto Red Cross (which actually preceded W6CUS-1, but was off the air for an extended period of time, and by AA4RE-1 BBS in Gilroy sponsored by the Garlic Valley Packet Radio Association, which was running an IBM system driven by brand new software written by WB7MBL which emulated the W0RLI BBS program that had been running on Xerox 820's for almost a year.

The first Northern California Sysop Association Meeting occurred at the Richmond Red Cross in Autumn of 1985 and was attended by groups from the WA6NWE-1 BBS (SACPAC), W6CUS-1 (EBPRA), AA4RE-1 (Garlic Valley), and N6IIU-1 (Palo Alto Red Cross). Topics discussed were the distribution of bulletins, the methods and times of forwarding (all was done on 145.09 MHz), the facilitation of NTS traffic, the routing of out of state traffic, and the development of alternative frequencies from 145.09 MHz for BBS usage. The second NORCAL Sysop Association Meeting occurred almost a year later, also at Richmond. The third meeting a few months later at the Palo Alto Red Cross.

EOF

PSNC (formerly NCXPN, BBS Sysop's) Meetings

October 22, 1994

Meeting held at Pacificon '94

WA6RDH: NORCAL Network gateway's and their connectivity, or lack of it.

Resolution: The problems with connectivity to both NCOAST and SBAY will soon be corrected, they will have backbone access in the near future. The matter of 2M forwarding was discussed, and it was decided that NCXPN would adopt a position of mandatory compliance with the ban on primary 2-meter forwarding. Forwarding to/from any gateway that results on traffic moving over 2-meter's will cease on January 1, 1995. This means that gateway's doing their primary forwarding on 2-meter's will need to change their forwarding to other means by this date.

WA6AEO: Discuss the possibility of adopting a minimum requirement for gateway's, similar to what we require for new BBS's to join the network. If we do this, we should probably grandfather all existing gateway's (?) as well as encourage them to meet the new minimums.

Resolution: WA6AEO will put together a proposal for the next meeting. The intent is to ensure that all gateway's have reliable access to the backbone, directly or indirectly, via means other than 2-meter's and the like.

WA6HAM: Review of the success of the East Bay LAN Improvement Project effort and how it applies to other LANs.

Resolution: WA6HAM had to leave early, and since the meeting was running late this item will be put on the agenda for the next meeting.

KI6YK: AB6GQ's "Bulletin Message Content" bulletin.

Resolution: The group recognizes the controversial nature of this issue and it's being subject to various interpretations. There is no need for any action on this and no change in Network policy is required.

WA6AEO: Issues relating to 145.70 MHz packet spectrum.

Resolution: Some discussion of this packet band and coordination with CENCA. Further action will be taken soon by NCPA and NCXPN.

WX3K: WX3K, KC6PJW and N6GN will present a quick briefing on the 284kbd linking project. Further discussion of high-speed networking and NORCAL.

Resolution: The NCOAST LAN has added a 230kilobaud RF linking system to it's Sonoma Mountain nodestack. The higher speed hardware involved in the system uses the 10W, 904MHz digital radios designed and built by N6GN and previously reported in the Autumn 1993 edition of NCPA's "Downlink". The TNC-2 controllers which had previously limited speeds to 38.4kbps have been replaced with Ottawa Amateur Radio Club PI2 cards hosted by the 386 JNOS computers at our sites. N6GN has modified these cards and their drivers so that they can support the higher speed. WA6AEO: Presentation of N6QIY's Network Diagram.

Resolution: Some problems were encountered with printing the new Network Diagram, so it could not be previewed at the meeting. It will probably be released soon to the NORCAL Sysops via packet.

WX3K: The status of SALE@ALLUS. The current policy is to ban them, but some gateway's are not.

Resolution: It was voted to remove the ban on SALE@ALLUS and SALE@WW traffic. It is up to the individual gateways whether they wish to receive it.

WX3K: Status of the SATGATE. Current NORCAL Network policy is that all non-continental U.S. traffic is routed to the satellites.

Resolution: It seems that all SATGATE traffic sent to W9HGI is being uplinked to the satellites and forwarded to Manitoba, Canada. It then is forwarded via internet. W9HGI will be queried as to what is happening, and if necessary we may need to make other arrangements for this traffic.

June 3, 1995

WB9LOZ: What BBS's handle NTS traffic? (It would be nice to know what areas are covered by what BBS's since I occasionally have to manually forward NTS messages for zips that aren't in the zip list we received ages ago.)

Resolution: The list of zips provided by the ARRL NTS liaison is becoming out of date. N0ARY will contact Brad Wyatt K6WR to advise him NTS on Packet is somewhat broken - we need updated routing info and better help from users in delivering these messages when they arrive on our BBS's.

WA6ZTY: New outlet for FPO/APO zipcodes. Can anyone handle locally?

Resolution: WA6ZTY will look into the possibility of handling these zips by sending them to WA state, and will advise the gateway's when this forwarding scheme is set up.

WA6AEO: Review proposed NCXPN gateway Policy.

Resolution: The proposal that WA6AEO/WA6HAM worked up was read. Some comments were made. AEO will distribute it to the gateway's for further comments, and later it will also be sent around SYSOP@NCPA.

KA6EYH: Review of NCXPN BBS coordination policy.

Resolution: Roy reminds us that if you make any substantive change to your operation, like changing frequency, you need to contact him ahead of time for coordination. The LAN gateway's also need to keep in mind that any new BBS going into operation on their LAN MUST seek coordination!

KC6PJW: 2M forwarding. N6IYA from Castle Rock. The disposition of the IYA and AA4RE cases.

Resolution: MUCH discussion about possible ways to alleviate the interference to PJW on 09. It was decided that a PARTIAL solution would be to only forward to/from N6IYA between the hours of midnight and 6 a.m., when user activity would be very low. The only BBS that will forward bulletins to IYA will be KA6EYH, also between the hours of midnight and 6 a.m. It is hoped N6IYA will change his forwarding to reflect this new policy, which the other gateway's will put in place immediately. Concurrently, we will continue to seek other avenues of compromise to eliminate interference to BBS users from 2-meter forwarding.

WB9LOZ: Discuss N6IYA's bulletin forwarding proposal.

Resolution: The group discussed several proposals being made to improve bulletin forwarding, including one such plan published in the TAPR newsletter. The general feeling expressed is that the NCXPN would seriously consider any proposal made by a national organization such as TAPR.

WB9LOZ: Bulletin forwarding: What gateways forward bulletins to what other gateways? Do all gateways receive bulletins from at least two other gateways? Which LAN's carry @WW bulletins? GATEWAY'S: PLEASE BRING OR PROVIDE AHEAD OF TIME YOUR DISTRIBUTION.

Resolution: After compiling the data provided by each LAN gateway, it appeared on first look that bulletin forwarding between gateway's is in pretty good shape. WA6ZTY and WB9LOZ will be looking over the data some more, and will make any suggestions that may be necessary to fine tune things.

WA6HAM: Review of the success of the East Bay LAN Improvement Project effort and how it applies to other LAN's. Postponed from last meeting.

Resolution: WA6HAM gave a short talk on this EBAY LAN fund raising effort.

WB9LOZ: General discussion of the BBS network - HF, 2m, 220, 430, 440, telephone and Internet: who connects to who on what frequencies for primary service, what links are phone or internet only, what backup paths are available in the event of path failure, what's in the planning stages (if anything)?

Resolution: Some brief discussion followed about some of the backup links available to our network, including Internet, the EBAYSACVAL link, the NBAYWBAY link etc.

KI3V: The Nevada Packet Coordinators Committee and it's relationship to NCXPN and NCPA. BBS operations in and to/from the NPCC area.

Resolution: The NPCC's efforts were discussed. Since KI3V was not present, no action was taken.

WB9LOZ: NCWP forwarding: Is everyone receiving distribution of the NCWP Regional updates?

Resolution: It appeared everyone at the meeting was satisfied that NCWP is getting around to who it needs to, with the possible exception of N0ARY who will be checking. Also N0ARY will modify his BBS code to only forward local user WP data to WA6AEO.

December 10, 1995

WA6AEO: Review and adoption of the LAN Gateway Policy.

Resolution: The proposed LAN Gateway Policy was approved by those attending the meeting. The Policy will be distributed @NCPA, and if there are no major objections after 30 days, it will take effect.

WA6HAM: It should be noted that those sysop's submitting items for discussion at NCXPN meetings should not expect them to be discussed if they cannot appear to represent them at the meeting.

Resolution: A person submitting an agenda item should be in attendance. If they don't show up, the item will likely be tabled. If the Director can represent the item to the meeting, it may be added to the agenda under the Director's call.

WA6AEO: Change name from NCXPN to Northern CA Sysop's Association or the like for clarification of our role.

Resolution: The new name is now the Packet Sysop's of Northern California, or PSNC.

W6BNG: AMTOR/PACTOR forwarding problems (lost messages) to/from Maritime-Mobiles out in the S. Pacific. What can NCPA do, since this is a wide area, western states/APLINK problem? What can the "Cruisers" do to help alleviate the problem?

Resolution: It is possible that bad WP data is causing messages to be lost, since the stations are moving BBS's frequently. Otherwise, more informa-

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Northern California Packet Band Plan

50 MHz

51.12	SOCAL backbone
51.14	Experimental
51.16	Keyboard to Keyboard
51.18	Experimental

144 MHz

144.91	Keyboard to Keyboard
144.93	LAN[1]
144.95	DX Cluster
144.97	LAN
144.99	LAN
145.01	APRS
145.03	Keyboard to Keyboard
145.05	Keyboard to Keyboard
145.07	LAN
145.09	LAN
145.61	9600 bps
145.63	LAN
145.65	TCP/IP 9600 bps
145.67	DX Cluster
145.69	LAN
145.71	9600 bps
145.73	LAN
145.75	TCP/IP
145.77	DX Cluster
145.79	LAN
146.58	DX Cluster

[1]Some TCP/IP activity in Sacramento grandfathered.

220 MHz

223.54	Node uplink (East Bay)[1]
223.56	Node uplink (East Bay)
223.58	Node uplink ("Other")[2]
223.60	Node uplink (Sacramento Valley)
223.62	Node uplink (South Bay)
223.64	TCP/IP
223.66	Keyboard to Keyboard
223.68	LAN
223.70	Node uplink (Monterey Bay)
223.72	Node uplink (North Bay)
223.74	DX Backbone

[1]To move to .56 when SOCAL coordinates

[2]TCP/IP interlink (Sacramento) Not to interfere with node uplink.

440 MHz

433.05	TCP/IP Backbone (100 Khz wide)
433.15	NETROM Backbone (100 Khz wide)
433.25	DX Cluster Backbone (100 Khz wide)
433.31	Experimental
433.33	Experimental
433.35	Experimental
433.37	LAN
433.39	DX Cluster backbone
433.41	BBS Interlink
433.43	9600 Bps
433.45	BBS Interlink
433.47	NETROM Interlink (KB-to-KB)
433.49	TCP/IP
441.50	All

433MHz allocations are currently the subject of negotiations with NARCC and other band occupants and may be subject to modification at some point in the future. Contact NCPA Frequency Coordinator for details.

900 MHz

903.500	1 Mhz wide - TCP/IP
904.500	1 Mhz wide - TCP/IP
915.500	1 Mhz wide - Experimental
916.100	200 Khz Wide - Experimental
916.300	200 Khz Wide - Experimental
916.500	200 Khz Wide - Experimental
916.650	100 Khz Wide - Experimental
916.750	100 Khz Wide - Experimental
916.810	20 Khz Wide - Experimental
916.830	20 Khz Wide - Experimental
916.850	20 Khz Wide - Experimental
916.870	20 Khz Wide - Experimental
916.890	20 Khz Wide - Experimental
916.910	20 Khz Wide - Experimental
916.930	20 Khz Wide - Experimental
916.950	20 Khz Wide - Experimental
916.970	20 Khz Wide - Experimental
916.990	20 Khz Wide - BBS links (Contra Costa County only)

900 MHz activity is on a non-interference basis to vehicle locator service. 900 MHz is not considered suitable for omindirectional systems, use for point-to-point links only.

1296 MHz

1248.500	1 Mhz wide - Full duplex with 1299.500 Experimental
1249.000 to 1249.450	Unchannelized - Experimental
1249.500	100 Khz wide - Experimental
1249.600	100 Khz wide - Experimental
1249.700	100 Khz wide - Full duplex with 1299.700 Experimental
1249.800	100 Khz wide - Full duplex with 1299.800 Experimental
1249.870	20 Khz wide - Experimental
1249.890	20 Khz wide - Experimental
1249.910	20 Khz wide - Full duplex with 1299.910 Experimental
1249.930	20 Khz wide - Full duplex with 1299.930 Experimental
1249.950	20 Khz wide - Full duplex with 1299.950 Experimental
1249.970	20 Khz wide - Full duplex with 1299.970 Experimental
1249.990	20 Khz wide - Full duplex with 1299.990 Experimental
1250.500	1 Mhz wide - Experimental
1251.500	1 Mhz wide - Experimental
1297.000 to 1298.000	Unchannelized - Experimental
1298.500	1 Mhz wide - Full duplex with 1299.500
1299.000 to 1299.450	Unchannelized - Experimental
1299.500	100 Khz wide - Experimental
1299.600	100 Khz wide - Experimental
1299.700	100 Khz wide - Full duplex with 1249.700 Experimental
1299.800	100 Khz wide - Full duplex with 1249.800 Experimental

1299.870	20 Khz wide - Experimental
1299.890	20 Khz wide - DX Packet Cluster users
1299.910	20 Khz wide - Full duplex with 1249.910 Experimental
1299.930	20 Khz wide - Full duplex with 1249.930 Experimental
1299.950	20 Khz wide - Full duplex with 1249.950 Experimental
1299.970	20 Khz wide - Full duplex with 1249.970 Experimental
1299.990	20 Khz wide - Full duplex with 1249.990 Experimental

Definitions

Experimental — Anything goes except full service BBS or any 24 Hr/Day services (nodes, gateways, etc). This is where you can come and test new gear, programs, etc. These channels may be reassigned in the near future so no permanent activities please.

Backbone, Uplink, Interlink — No uncoordinated stations. These channels are for specific purposes as defined by the NCPA and affiliated groups. This is where the various BBS, nodes, and clusters interlink and are very high usage channels. Please use the normal 2 meter entry points of the network you want to access rather than these channels.

Keyboard to Keyboard — Anything but full service BBS, TCP/IP, or DX Cluster. Primarily chat channels. These are also the primary emergency channels. Some existing BBS systems (eg. WA6RDH) were grandfathered.

A gray area is "Personal BBS." A PBBS is one with a small number of users (rule-of-thumb: five or less). A PBBS should not be attracting general users thru beacons, etc. Bulletins should be confined to local information and not duplicate the general bulletins send to the community. That's the job of a full service BBS and we have lots of them in Northern California to use.

APRS — Automatic Packet Reporting System equipped stations and related activity.

LAN — Local Area Network. Anything except TCP/IP and DX Cluster is tolerated. Please avoid placing high level digipeaters or nodes on these channels since they are "local." A low-level node that links into a backbone on another frequency is the preferred implementation.

TCP/IP — Stations using TCP/IP protocol on top of AX.25. Some AX.25 tolerated to communicate to TCP/IP stations if p-persistance access method used.

DX Cluster — Northern California DX spotting network. No other activity should be on these channels.

9600 Bps — Stations using 9600 Bps with direct FSK (G3RUH, TAPR, etc.) modems.

Procedure for changes

Users should contact either the frequency coordinator or the NCPA board. The frequency coordinator will then present the requests to the board at the next meeting along with suggested assignments. The NCPA board elected by you, the packet user, makes all assignments!

Electronic mail is preferred.

Note: NCPA does not coordinate individual stations, nodes, etc. The only station coordination is done by PSNC for bulletin board systems, and DXPSN for DX packet spotting nodes.

Where to Find a BBS

N0ARY-1	Sunnyvale	144.93
N6VZT	Brentwood	144.93
KJ6FY-1	Benicia	144.93
WD6CMU	Richmond	144.97
N6EEG	Berkeley	144.97
N6LDL	Los Gatos	144.97, 145.71[1]
KD4CVR	San Ramon	144.97
KD6JZZ	Sonora	144.97
WA6EWV-1	S. Lake Tahoe	144.97
KA6FUB	Martinez	144.99, 441.50
W6PW-3	San Francisco	144.99
W7SF	Stockton	144.99
WA6RDH	Dixon	145.01, 441.50
N6IIU-1	Palo Alto	145.07, 223.56
KM6PX-1	Citrus Heights	145.07, 441.50
KC6PJW	Rohnert Park	145.07, 441.50
WA6NWE-1	North Highlands	145.09, 441.50, 144.93[2]
WA6YHJ-1	Livermore	145.09
KK6WD	Redding	145.09
KB6AML	Concord	145.09, 441.50
KD6KWM	Santa Rosa	145.09
KA6EYH-4	Pacifica	145.09, 441.50
KB5IC	Almaden	145.63
KE6LW-1	Yuba City	145.63, 441.50
WA6HAM	Pittsburg	145.69
KA6EYH-2	Daly City	145.69, 441.50
KA6JLT-2	Menlo Park	145.73, 441.50
AA6QR	Orinda	145.73
KB6MER	San Jose	145.73
K3MC	Fremont	145.75, 145.75[2]
KA6EYH-6	Pacifica	145.75
W6YX-9	Stanford U.	145.75
K7WWA	Willits	145.79
W6CUS-1	Richmond	145.79
N6RFZ-1	Point Reyes Stn.	145.79
N6QMY-1	Fremont	145.79, 441.50

[1]9600 baud port
[2]TCP/IP port

Where to Find DXPSN

K6OZL	Hanford	145.77
K6OZL	Bear Mtn./Fresno	144.95
K6OZL	Mt. Adelaide	145.77
N6ST	Santa Cruz Mtns.	146.595
K6LLK	Mountain View	144.95
K6AYA	Oakdale	146.58
W6OAT	Redwood City	145.77
KI3V	Reno, NV	144.95, 146.58
W6GO	Rio Linda	144.95
W6GO	Redding	144.93[1]
W6OTC	San Francisco	145.67
WB2CHO	Santa Rosa	144.95
KJ6NN	Milpitas	1299.90
AH0U	Pittsburg	146.58
AH0U	Napa Valley	146.58

[1]Temporary frequency assignment

NCPA Board Meetings

February 12, 1995

Jeri Bissell, N7YYG
NCPA Secretary

The NCPA Board of Directors meeting took place at the General Paramentrics Building in Berkeley on Sunday February 12, 1995 at 10:00AM. Present were the following board members:

WA5HQJ, AB6YM, KA6EYH, W6RGG, WB6YRU, WD6CMU, N7YYG, WB9LOZ

Also in attendance were: KA6QNN, KC6PJW

1. The meeting was called to order at 10:05.

2. GENERAL MEETING. The General Meeting will be the second Saturday of May, the 13th, at 1:00PM, after the Foothill Flea Market. It will be held at Tandem Computer, and the speaker will be Bruce Perens on "LINUX". A motion was made, and passed, to include a notice of the meeting, if possible, in the current issue of "DOWNLINK".

3. ELECTION. The election of board members will take place at the next general meeting.

4. SUB BAND. The DX cluster on 145.67 is apparently causing some interference with 145.66 used for simplex operation in the South Bay, and 145.68, a state assigned RACES frequency in Central Costa Co. 145.63 is has remote bases located on it. 145.65 has no TCP/IP as of yet.

5. TWO METER FORWARDING. BBS Forwarding was noted on two meters in No. Nevada on 144.97. This was referred to NCXPN if there is an interference issue. Two meter forwarding continues on 144.99 by AA4RE.

6. ATV. The new ATV frequency previously sought in the Central Valley has apparently been abandoned. AB6YM and WD6CMU will attend the next NARCC meeting.

7. 2.4 GIGAHERTZ. Ham Radio has been designated as the primary user of 23.40 - 24.00, with data PCS as the secondary user. AB6YM will compose a letter regarding communication and coordination with the secondary users, and report back to the board.

8. ARRL. It was moved and passed to have Bruce Perens re-write and resubmit to the ARRL the comments at the end of the 2.4 Gigahertz letter, regarding suggested changes in Part 97 of the FCC Rule Book regarding Ham Radio. These will be resubmitted to ARRL as a proposal.

9. INTERNET. WB0TAX is moving to LA, and KA6EYH will take over as the internet gateway.

10. 9600 BAUD. There was a general discussion of 9600 Baud frequencies and the scarcity of people using them.

The meeting was adjourned at 12:03PM.

June 3, 1995

Jeri Bissell, N7YYG
NCPA Secretary

The NCPA Board of Directors meeting took place at the Fire Station at the Lawrence Berkeley Lab on Saturday June 3, 1995 at 10:00 AM. Present were the following board members:

N0ARY, AB6YM, KA6EYH, N6HM, W6RGG, WB6YRU, WD6CMU, and N7YYG

Also in attendance were:

WA0YQM, KA6QNN, KC6PJW, KC6TCN, KD6KWM, WA6ZTY, and WB9LOZ

1. The meeting was called to order at 10:17 AM.

2. ELECTION. NCPA officers were elected:

Bruce Perens AB6YM -- President
Gary Mitchell WB6YRU -- Vice-President
Jeri Bissell N7YYG -- Secretary
Steve Overacker WA6HAM -- Treasurer
Eric Williams WD6CMU -- Frequency Coordinator
Roy Wysling KA6EYH -- Editor

3. SUB BAND. A simplex frequency in use in San Jose on 145.655 is experiencing some interference from the DXPSN on 145.67 and the TCP/IP on 145.65. After much discussion is was decided to leave 145.65 open for now, combining TCP/IP use with the high speed experimental of 145.61, and to encourage the simplex frequency users to switch to 145.65.

4. PACKET BAND PLAN. Eric, WD6CMU, will send the packet band plan out via packet, in the next newsletter, and will send it to ARRL for inclusion in the next repeater directory.

5. ARRL AFFILIATION. NCPA intends to apply for club affiliation with ARRL. N7YYG will do this via e-mail.

6. NEW DATA BAND. 219-220. DXPSN has placed a request for frequency use at a 9600 backbone channel.

7. DXPSN. Bob Vallio, W6RGG, will provide a copy of the DXPSN directory for inclusion in the next newsletter.

8. INFRASTRUCTURE/BACKBONE COMMITTEE. A Proposal was passed to create a committee to explore the design fundamentals and implementation of a high speed packet backbone for Northern California. Members are: KA6EYH, N6HM, KC6TCN, AB6YM, WB6YRU, KC6PJW, and WD6CMU. The committee will meet and report back to NCPA.

9. NEXT MEETING. the next NCPA Board Meeting will be Saturday August 12th. at 1 PM at a South Bay location.

The meeting was adjourned at 12 PM.

August 12, 1995

Location: Sunnyvale Department of Public Safety

Attending: WB6YRU, W6RGG, WA0YQM, N6HM, KD6PLD, WD6CMU, AB6YM, WB6STW

New Officers: Bruce Perens, AB6YM, resigned as President, citing personal medical problems and competing interests that left him insufficient time to perform the duties of the office as he felt they should be done. WB6YRU agreed to assume the President's office, WD6CMU will act as Vice President.

Interference: Complaints from ATV stations due to packet operations on 433.15 were reported by AB6YM. Bruce had been negotiating with N6FRI of NARCC for possible alternative frequencies, but no firm agreement had been reached so far.

Pacificon: AB6YM had purchased one table for NCPA's use at the upcoming ARRL Pacific Division Convention (we owe him $100). Bruce will have his own table during the show and will not be able to help out this year. WD6CMU and N6HM will bring a packet station for demonstration, WB6YRU will coordinate additional staffing. Please contact him if you can help for an hour or two. Proposed and accepted that we print a 1-page handout of frequency and BBS lists, to be given away, in addition to selling books and Downlink back issues. Three talks by NCPA were scheduled, it was decided to cancel one of them. Talks will be a packet intro and a Q&A session.

NCPA & NCXPN: WB6YRU raised the subject of merging NCPA with NCXPN and other packet special-interest groups to eliminate the duplication in goals and effort. Much discussion and several objections, mostly concerned with the practicalities of such a merger. Proposal was tabled for further research and discussion.

Newsletter: The Editor was not present. A general concern was expressed over the lack of timely production. N6HM proposed utilizing the journalism department of a local college to produce the newslet-

PSNC Meetings

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tion needs to be supplied...the involved gateway's will be glad to help to try to solve the problem.

WA6HAM: ALLCAN bulletins being sent out of Northern CA, especially to CENCA stations.

Resolution: ALLCAN, NCWP and NCPA should not be sent out of NORCAL. Please check your distribution lists...this traffic SHOULD NOT be going to N6IYA, AA4RE, WB6ZVW, K6RAU, among others.

WB9LOZ: The designators NA and ALLNA, should we consider adding one of them to our recognized list? Which one?

Resolution: The group decided to adopt @ALLNA for North America bulletins. All NORCAL gateway's and BBS's should add this distribution to their files.

WA6HAM: Coordination and cooperation problems between NCXPN and CENCA, as it relates to NORCAL stations changing affiliations to CENCA.

Resolution: MUCH discussion about this. The group is VERY concerned about the apparent lack of agreements between the two groups and the lack of any way to resolve conflicts that might arise. It is beneficial to BOTH groups to have some understandings, that are in writing, about how to coordinate our activities. To this end, KA6EYH and WB9LOZ will attempt to start the ball rolling on this, to be followed up by WA6AEO and others from CENCA, PSNC, and NCPA, to begin establishing these badly needed procedures. At the very least, before next meeting, there will be correspondence sent to CENCA advising them of our intentions and seeking their cooperation.

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NCPA Board Meetings

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ter for course credit. WB6YRU will contact the Editor to determine his plans.

6M Forwarding: WB6YRU proposed allocating one of the 6M channels to BBS forwarding to encourage its use. WD6CMU recommended that the proposal be presented to NCXPN to see if there was any demand for the additional channel. *[Note: after the meeting, it was determined that EBAY has been using 51.14 for forwarding for a couple of years.]*

Interference: WB6KSS has complained about interference from DXPSN operations on 146.58 to simplex voice operations on 146.565 and 146.595. W6RGG will investigate the possibility of a technical solution.

Packet vs Internet: Some concern expressed about the use of Internet for packet BBS forwarding, producing a reliance on facilities that may not be available in the event of an emergencies. Many long-distance links via HF, satellite, etc. have been dismantled due to disuse and competition. Others feel that if the emergency is of such a magnitude that such links are disrupted, it is likely that BBS operation would have been disrupted anyway. Some complaints about the speed of even the local forwarding networks. WD6CMU will investigate some ways of testing and diagnosing local links.

Membership: WB6YRU proposed extending membership to cover the delays in newsletter production. W6RGG noted that this had already been approved by the board. WB6YRU will check on this with Secretary, who was not present.

High-speed Backbone: No news from the Infrastructure Committee, which AB6YM was chairing and was never called to meet. AB6YM's proposed 9600 baud full-duplex repeater was never approved for coordination by NARCC. WB6YRU will contact some parties and collect some background information.

ARRL Affiliation: Secretary was not present to report, but had stated before the meeting that no progress had been made.

Next Board Meeting: Saturday, October 28th. Location to be determined.

Eric Williams WD6CMU recording

November 12, 1995

Location -- Sunnyvale Public Safety Building.

Board members and officers attending: WD6CMU, WA6HAM, N6HM, KD6PLD, W6RGG, and WB6YRU Also in attendance were: N0ARY and KD6MXL

Meeting called to order at 10:20 AM by WB6YRU.

PACIFICON NCPA's effort at Pacificon were successful. The demo's at the table went over well, especially Howard's (N6HM) packet remote control and sensing demo. Howard will have a packet demo again for next year. Bob W6RGG will look into having a DXPSN demo. Discussion followed about other possible demonstrations.

Special thanks go to Howard N6HM and Eric WD6CMU for much help at the table and their packet demonstrations. Also to Bob N0ARY for his Intro To Packet talk and the following for being on the Packet Q&A session: Bob N0ARY, Bob W6RGG, Brad WA6AEO, and Eric WD6CMU.

TREASURER The costs at Pacificon were $337. We gained 25 new members and renewals, 31 Intro to TCP/IP books sold, and 43 Into to Packet books sold. Gross income was $683, net was $346. The consensus was: as long as we were able to cover the costs, that was fine, we should do it again next year.

We currently have $1946 (after Pacificon), this should be enough to cover the costs of publishing the Downlink for next year.

Discussion of what to do with our extra "Intro" books.

RESIGNATION Bruce AB6YM has resigned from the board. We currently have enough board members, but it would be nice to have another board member to represent APRS.

DOWNLINK Discussion of lack of an editor, lack of production and article sources. WB6YRU is filling in as editor--would like articles soon for late November publication.

Discussion of what to include in the news letter. We possibly might making a special issue using the CPRL

N6HM: motion attract an editor by offering $50 per issue after the production of each issue. Discussion of the motion, what the editor does, etc. WD6CMU: motion to table for now. Motion to table passed.

COORDINATION 219-220 MHz digital sub-band: FCC is letting the ARRL handle coordination of this band. ARRL evidently is having NARCC do it in our region. The ARRL has not responded to us on this so far. WB6YRU will contact Brad, K6WR, ARRL Pac. Dir. for details about this. W6RGG will follow up if Brad can't provide information.

NCPA will build up a database of all packet activity in our region--WB6YRU will do it. This database will be used for coordination and for general reference on packet activity when dealing with ARRL/FCC.

On the new packet sub-band, 145.6-145.7 MHz, the board had voted to changed 145.65 to "reserved" to give time for certain simplex FM users to move. W6RGG: motion to restore the 145.6-145.7 to the original allocation. Motion passed. The last Downlink (issue #14) contains the correct band plan as will the next issue.

Discussion about the NCPA and NARCC forming a better working relationship. WB6YRU, WD6CMU, and WA6HAM will work on this.

OLD BUSINESS W6RGG: That problem WB6KSS had with packet on 146.58 turned out to be nothing... he felt this should be voice simplex because it's that way in Kansas.

N6HM: This basic concept needs to be spelled out better--VHF/UHF band plans are NOT consistent across the country. Different areas have different needs.

High-speed Backbone: General discussion about the technology and problems. Consensus was to contact those people experimenting with high-speed packet and proceed as the technology allows.

ARRL Affiliation: No news from the Secretary (not present).

MEETINGS We have a general meeting coming up, probably in April.

Next board meeting will probably be in January, (exact date and location to be determined, probably in Livermore or North Bay area.)

Adjourned 1:51 PM

WB6YRU recording, on behalf of the Secretary

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NCPA Directors

Eric Williams, WD6CMU
WD6CMU @ WD6CMU
510-237-9909

Bob Vallio, W6RGG
W6RGG@N6QMY
510-537-6704

Roy Wysling, KA6EYH
KA6EYH @ KA6EYH
415-355-2281

Howard Krawetz, N6HM
N6HM @ N0ARY
408-739-7936

Steve Walch, KD6PLD
KD6PLD @ N6IIU

Larry Eker, WA0YQM
WA0YQM @ N6QMY

Gary Mitchell, WB6YRU
WB6YRU @ N0ARY
408-265-2336

Jeri Bissel, N7YYG
N7YYG @ WA6HAM

NCPA Officers

President:
Gary Mitchell, WB6YRU
WB6YRU @ N0ARY

Vice-President:
Eric Williams, WD6CMU
WD6CMU @ WD6CMU

Secretary:
Jeri Bissel, N7YYG
N7YYG @ WA6HAM

Treasurer:
Steve Overacker, WA6HAM
WA6HAM @ WA6HAM

Acting Newsletter Editor:
Gary Mitchell, WB6YRU
WB6YRU @ N0ARY

Frequency Coordinator:
Eric Williams, WD6CMU
WD6CMU @ WD6CMU

Education Coordinator:
Larry Kenney, WB9LOZ
WB9LOZ @ W6PW

What is the NCPA?

NCPA, the Northern California Packet Association, is an organization formed to foster the digital communications modes of Amateur Radio. Our goals are:

- **Education**

  Education means making information available about various digital modes. This newsletter is but one part of that education process.

- **Coordination**

  Coordination activities include frequency coordination (NCPA is recognized by NARCC as the official packet radio frequency coordinator) and band planning as well as coordinating people and their various uses of packet radio, be they DX Cluster, BBS, TCP/IP, keyboard-to-keyboard, NET/ROM, Traffic/NTS, emergency uses of packet, or even experimenting with new frontiers of various digital modes.

We in NCPA believe that the next revolution in Ham Radio will come about in digital communications technology and in the beneficial coordination among <u>all</u> users of ham digital communications technologies.

NCPA *Downlink*

Northern California Packet Association
PO Box 61716
Sunnyvale, CA 94088-1761

First Class Mail